



UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office

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Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/034,847	03/04/98	NAGLE	J 16860-000200

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LM61/1108

EXAMINER  
SEALEY, L

ART UNIT 2772  
 PAPER NUMBER 3

DATE MAILED: 11/08/99

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

<b>Notice of Allowability</b>	Application No. <b>09/034,847</b>	Applicant(s) <b>Nagle</b>
	Examiner <b>Lance Sealey</b>	Group Art Unit <b>2772</b>

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course.

This communication is responsive to the application filing of 3/4/98.

The allowed claim(s) is/are 1-36.

The drawings filed on \_\_\_\_\_ are acceptable.

Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

All  Some\*  None of the CERTIFIED copies of the priority documents have been

received.

received in Application No. (Series Code/Serial Number) \_\_\_\_\_.

received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_.

Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" of this Office action. Failure to timely comply will result in ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.

Applicant MUST submit NEW FORMAL DRAWINGS

because the originally filed drawings were declared by applicant to be informal.

including changes required by the Notice of Draftsperson's Patent Drawing Review, PTO-948, attached hereto or to Paper No. \_\_\_\_\_.

including changes required by the proposed drawing correction filed on \_\_\_\_\_, which has been approved by the examiner.

including changes required by the attached Examiner's Amendment/Comment.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the reverse side of the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any response to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE/SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

**Attachment(s)**

- Notice of References Cited, PTO-892
- Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_
- Notice of Draftsperson's Patent Drawing Review, PTO-948
- Notice of Informal Patent Application, PTO-152
- Interview Summary, PTO-413
- Examiner's Amendment/Comment
- Examiner's Comment Regarding Requirement for Deposit of Biological Material
- Examiner's Statement of Reasons for Allowance

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J. Douglas  
11/12/99

### ***Response to Amendment***

### **REASONS FOR ALLOWANCE**

The following is an Examiner's Statement of Reasons for Allowance: No prior art anticipates or suggests a method of computer operation and a software system for operating a computer to generate realistic collisions between articulated animated bodies that iteratively calculates body positions from previous positions using a simulated contact force between colliding bodies which has a nonlinear relationship with respect to the closest-points vector defined between the bodies such that the force increases sufficiently rapidly as the closest-points vector goes to zero to overcome the motions causing the collisions between the bodies.

The prior art most closely employing the features of this application is Goyal et al. ("Goyal," U.S. Pat. No. 5,625,575). Goyal also discloses a software system/method/apparatus for modelling or simulating the dynamics of colliding bodies, but the bodies Goyal considers are rigid, not articulated. The Examiner's Amendment below, agreed to by the examiner and the applicant, represents a redrafting of independent claims 1 and 19, and dependent claims 6 and 24, in order to make the application allowable.

Any comments considered necessary by the applicant must be submitted no later than the payment of the Issue Fee and, to avoid processing delays, should preferably **accompany** the Issue Fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance." Any inquiry concerning this communication should be directed to Exr. Lance W. Sealey at (703) 305-0026 (voice), (703) 308-6606 (fax).

### **EXAMINER'S AMENDMENT**

(Amended) 1. A method for the computer animation of [two] a plurality of colliding bodies by the iterative calculation of body positions from previous positions, said method comprising:

receiving data defining physical properties of said bodies, said physical properties including positions and shapes of said bodies, at least one of said colliding bodies having a first body part connected to a second body part by a joint, said joint having at least one rotational degree of freedom;

determining a collision between said bodies;

calculating a closest-points vector between said two bodies from said physical properties of said bodies;

calculating a contact force on said at least one of said bodies, said contact force along said closest-points vector and having a nonlinear relationship with respect to said closest-points vector such that said force increases sufficiently rapidly as said closest-points vector goes to zero to overcome motions causing said collisions between bodies;

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calculating a position of said at least one of said bodies at a subsequent time interval in response to said contact force upon said body, including positions of said first body part and said second body part;

iteratively repeating said collision determining, closest-points vector calculating, contact force calculating and position calculating steps for subsequent time intervals; and

displaying calculated positions of said bodies, including said body parts, at selected time intervals for a realistic animation of said colliding bodies.

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*B2*  
(Amended) 6. The method of claim 1 wherein [at least one of said colliding bodies comprises a first body part connected to a second body part by a joint,] said joint further has [having at least one rotational degree of freedom,] a joint limit stop and a maximum allowed rotation limit; [and] said method comprising:

determining a rotation of said first body part about said joint to reach said joint limit stop;

*31*

*B2*  
*and*

calculating a torque upon said first body part along said one rotational degree of freedom, said torque having a nonlinear relationship with respect to an angle of rotation from said maximum allowed rotation limit such that said torque increases sufficiently rapidly as said angle goes to zero to overcome motions causing said rotation of said first body part about said joint; calculating a rotational position of said body part at a subsequent time interval in response to said torque upon said body part; and

iteratively repeating said rotation determining, said torque calculating, and said rotational position calculating steps for subsequent time intervals.

*and C3*

(Amended) 19. A computer program for the realistic computer animation of [two] a plurality of colliding bodies by the iterative calculation of body positions from previous positions, said method comprising:

*B3*

code that receives data defining physical properties of said bodies, said physical properties including positions and shapes of said bodies, at least one of said colliding bodies having a first body part connected to a second body part by a joint, said joint having at least one rotational degree of freedom;

code that determines a collision between said bodies;

code that calculates a closest-points vector between said two bodies from said physical properties of said bodies;

code that calculates a contact force on said at least one of said bodies, said contact force along said closest-points vector and having a nonlinear relationship with respect to said closest-points vector such that said force increases sufficiently rapidly as said closest-points vector goes to zero to overcome motions causing said collisions between said bodies;

code that calculates a position of said at least one of said bodies at a subsequent time

*24*

interval in response to said contact force upon said body, including positions of said first body part and second body part;

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contd.*  
code that iteratively repeats said collision determining, closest-points vector calculating, contact force calculating and position calculating steps for subsequent time intervals;

*C3  
contd.*  
code that allows a computer display to display calculated positions of said bodies, including said first and second body parts, at selected time intervals for a realistic animation of said colliding bodies; and

a computer-readable medium that stores said codes.

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(Amended) 24. The computer program of claim 19 wherein [at least one of said colliding bodies comprises a first body part connected to a second body part by a joint,] said joint further has [having at least one rotational degree of freedom,] a joint limit stop and a maximum allowed rotation limit; [and] said method comprising:

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code that determines a rotation of said first body part about said joint to reach said joint limit stop;

code that calculates a torque upon said first body part along said one rotational degree of freedom, said torque having a nonlinear relationship with respect to an angle of rotation from said maximum allowed rotation limit such that said torque increases sufficiently rapidly as said angle goes to zero to overcome motions causing said rotation of said first body part about said joint;

code that calculates a rotational position of said body part at a subsequent time interval in response to said torque upon said body part; and

code that iteratively repeats said rotation determining, said torque calculating, and said rotational position calculating steps for subsequent time intervals.

*Mark*  
MARK R. POWELL  
SUPERVISORY PATENT EXAMINER  
GROUP 2700



UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office

NOTICE OF ALLOWANCE AND ISSUE FEE DUE

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APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/034,847	03/04/98	036	SEALEY, L	2772 11/08/99
First Named Applicant	35 USC 154(b) term ext. = 0 Days.			

TITLE OF INVENTION: METHOD AND SYSTEM FOR GENERATING REALISTIC COLLISIONS IN GRAPHICAL SIMULATIONS

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEES DUE	DATE DUE
2 16860-000200	345-473.000	D94	UTILITY	YES	\$605.00	02/08/00

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED.**

**THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.**

**HOW TO RESPOND TO THIS NOTICE:**

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or

B. If the status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

A. Pay FEE DUE shown above, or

B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

II. Part B-Issue Fee Transmittal should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B Issue Fee Transmittal should be completed and returned. If you are charging the ISSUE FEE to your deposit account, section "4b" of Part B-Issue Fee Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give application number and batch number.

Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

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